

High Temperature, Radiation Hard Electronics Architecture for a Chemical Sensor Suite for Venus Atmospheric Measurements, Phase I

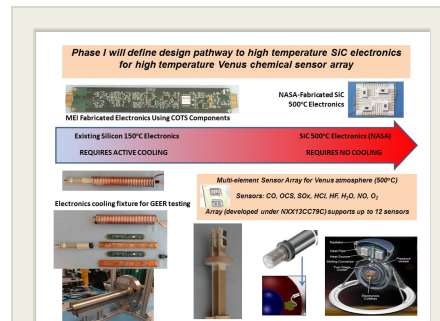
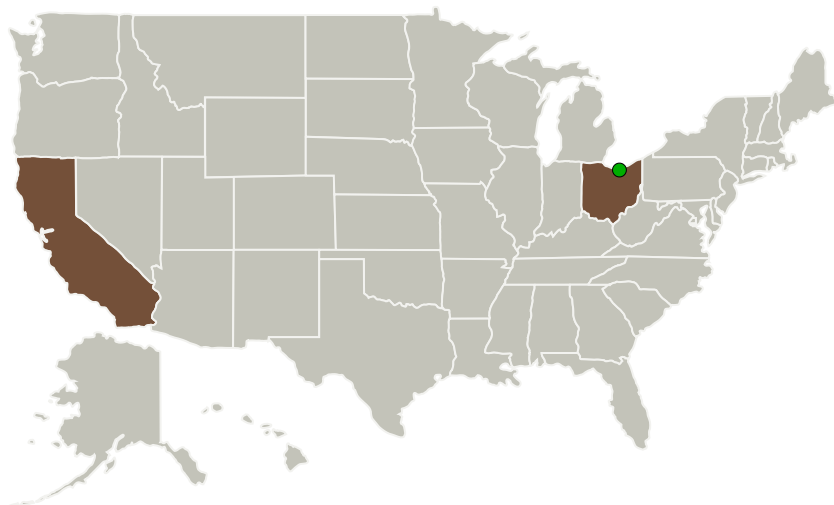
Completed Technology Project (2016 - 2016)



Project Introduction

Makel Engineering, Inc. proposes to develop a high temperature, radiation hard electronics sensing architecture for a high temperature chemical sensor array suitable for measuring key chemical species in the Venus atmosphere. The previously developed Venus Microsensor Chemical Array (VMCA) consists of sensing elements which can operate in a 500 C environment, but which currently rely on silicon based electronics for signal acquisition, control and data transmission, which requires active cooling for a Venus mission deployment. NASA GRC has demonstrated simple SiC electronic circuits, such as differential amplifiers and logic gates that were packaged and operated for a world-record of thousands of hours at 500 C. Ongoing work at NASA, universities, and industry is increasing the complexity and capability of SiC devices. This proposal aims to develop electronics designs and architecture to enable NASA's high temperature SiC electronics to be applied to the VMCA to form a science instrument suitable for a future Venus mission. Phase I will develop innovative designs using near term SiC components to provide transduction and signal processing needed to operate the VMCA without active cooling. Phase I designs will be demonstrated in hardware using silicon versions of electronics components which are achievable in SiC. This process is the key first step in applying emerging development of SiC electronics to a harsh environment chemical sensing need. Phase II will focus on implementation of the SiC electronics design utilizing the best available SiC components.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Makel Engineering, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Chico, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

California	Ohio
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Project Transitions

**June 2016:** Project Start**December 2016:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139758>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Makel Engineering, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

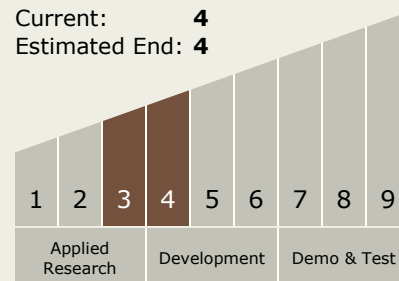
Carlos Torrez

Principal Investigator:

Darby B Makel

Technology Maturity (TRL)

Start: 3
 Current: 4
 Estimated End: 4

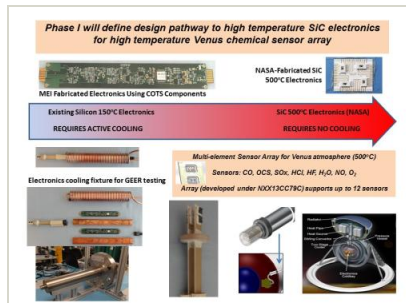


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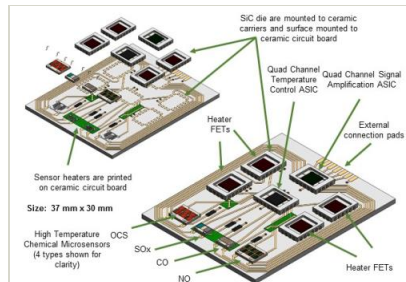
Images



Briefing Chart Image

High Temperature, Radiation Hard Electronics Architecture for a Chemical Sensor Suite for Venus Atmospheric Measurements, Phase I

(<https://techport.nasa.gov/image/135854>)



Final Summary Chart Image

High Temperature, Radiation Hard Electronics Architecture for a Chemical Sensor Suite for Venus Atmospheric Measurements, Phase I Project Image

(<https://techport.nasa.gov/image/126715>)

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - TX08.3 In-Situ Instruments and Sensors
 - TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System